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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/583,421 | 06/19/2006 | Loes Elizabeth Bevers | F7752(V) | 1710 |

201 7590 07/23/2010
UNILEVER PATENT GROUP
800 SYLVAN AVENUE
AG West S. Wing
ENGLEWOOD CLIFFS, NJ 07632-3100

| EXAMINER | |
|---|---|
| THAKUR, VIREN A | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1782 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 07/23/2010 | ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentgroupus@unilever.com

| **Office Action Summary** | **Application No.**<br>10/583,421 | **Applicant(s)**<br>BEVERS ET AL. | |
|---|---|---|---|
| | **Examiner**<br>VIREN THAKUR | **Art Unit**<br>1782 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *01 April 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1,6,7,11-15 and 19-24* is/are pending in the application.

4a) Of the above claim(s) *11-15* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,6,7 and 19-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 26, 2010 has been entered.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. **Claims 1, 6-7, 19-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.**

Claim 1 recites the limitation "cross-linked biopolymer." This limitation is not clear as to whether only the "sugar beet pectin" is cross-linked or whether "sugar beet pectin having chemically attached feruloylated glycerides" is cross-linked. That is, the claim does not clarify whether the cross linking occur between feruloylated glycerides and the sugar beet pectin or whether the cross-linking between sugar beet pectin and

itself or some other component. A similar ambiguity occurs with the "chitosan having covalently coupled vanillin groups."

Claim 22 recites "where in the lipid material is an edible fat selected from the group consisting of sunflower oil, coconut oil, rapeseed oil, olive oil, peanut oil and combinations thereof." The term "edible fat" is not consistent with the components listed in the Markush grouping, which are all oils, especially in view of claim 1, which differentiates between waxes, fats and oils.

### *Claim Rejections - 35 USC § 103*

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**6. Claims 1,6-7,19-20 and 23 are under 35 U.S.C. 103(a) as being unpatentable over Nishiura et al. (JP 05-168401) in view of Muzzarelli (GB2272447), as further evidenced by Hall et al. (US 4424346), Tharanathan ("Biodegradable films and composite coatings: past, present and future") and Ninomiya et al. (US 5089307) and in further view of Compton (US 6346236), Warner ("94$^{th}$ AOCS Annual Meeting & Expo"), Uemura (JP05168449), Tanner (WO9201394) and Goddard (WO0052092) and in further view of Iverson (US 20030203084), Haugaard, and Franzoni (US 5077052).**

Regarding claims 1 and 23, Nishiura et al. teaches an edible barrier "suitable for use in food products" comprising chitosan, vanillin and a lipid material, for the purpose of protecting the food product (see abstract and paragraph 0010, 0014 and 0015 of the machine translation).

Claims 1 and 23 differ from Nishiura et al. in reciting that the edible barrier comprises a covalently cross-linked biopolymer of chitosan having covalently coupled vanillin groups and chemically attached feruloylated glycerides.

Regarding the chitosan having covalently coupled vanillin, it is noted that Muzzarelli teaches cross-linking chitosan with an aldehyde, such as vanillin (see page 4 and page 5 paragraph beginning with "The preferred aldehydes…"). As a result of the interaction between the chitosan and the aldehyde such as vanillin, the film that can be produced has improved strength and improved insolubility (see page 7). To thus modify Nishiura et al. and couple the chitosan with vanillin, as taught by Muzzarelli

would have been obvious to one having ordinary skill in the art, for the purpose of improving the strength of the film.

Regarding the covalent coupling of vanillin groups, it is noted that Muzzarelli teaches a process for combining chitosan with vanillin that is substantially similar to that disclosed in applications specification, page 11, lines 9-27). That is, Muzzarelli teaches dissolving chitosan in an acidic aqueous medium and then adding the aldehyde (see page 6, 1st-4th full paragraph and the 5th paragraph). It is noted that Muzzareli also teaches a Schiff reaction, which applicants disclose on page 7, lines 2-3 is another mechanism for coupling vanillin to the chitosan backbone. This is further evidenced by Hall et al., who teaches that Schiff base formation and reductive amination provides a convenient route for attaching a wide range of molecules to chitosan (column 3, lines 45-54 and lines 55-62). Tharanathan further evidences that cross linking chitosan with an aldehyde increases the toughness and water insolubility of the film (see page 73, right column, "Polysaccharides..."). Thus, it is noted that applicants are not the first to covalently link chitosan with vanillin to form a cross-linked biopolymer. It is further noted that Ninomiya et al. also teaches crosslinking a substance to chitosan, for the purpose of improving the strength of the film (column 4, lines 7-15).

Regarding the limitation of "chemically attached feruloylated glycerides" the above combination is silent in this regard. It is noted however, that the claim does not limit how the feruloylated glycerides are chemically attached and thus reads on any type of chemical attachment. In light of this, it is noted that Nishiura teaches making a film by using a combination of chitosan, a glycerides (i.e. a glycerine fatty acid ester) and

vanillin together (see paragraphs 0014, 0015 and 0016 of the machine translation). Nevertheless, Compton teaches employing feruloylated glycerides in water in oil or oil in water emulsion compositions (column 7, lines 2-5), for the purpose of preventing the emulsion from being readily washed off with water (see column 5, lines 52-56). Compton further teaches that the feruloylated glycerides can be used in applications other than sunscreens (column 2, lines 11-14 and column 7, lines 52-54) and further teaches that the modified ferulate compounds renders the compounds water insoluble (column 2, lines 3-7). Additionally, the art has recognized employing these feruloylated glycerides in food related applications, such as for preventing deterioration of frying oil and of the potato chips, as evidenced by Warner (see page 93, "Addition of Feruloylated Monoacyl- and Diacylglycerols to Frying Oils"). This is similar to Nishiura, who teaches that the glycerides aide in providing germicidal action (see paragraph 0015 of the machine translation). Uemura even teaches that it has been conventional to associate a ferulate with chitosan (see paragraph 0010 and 0012). In view of these teachings, it is noted that the art has recognized that feruloylated glycerides provide the additive function of preventing water solubility in emulsions and which can prevent water from dislodging the film, and that they can be applied in food related applications for preventing deterioration of the food. The art has also recognized modifying chitosan with feruloylated compounds. Therefore, to modify the chitosan, as taught above, and further employ feruloylated glycerides would thus have been obvious to one having ordinary skill in the art, for the purpose of ensuring that the edible barrier also is water insoluble and prevents deterioration of the food. Regarding the chemical attachment

Nishiura does not specifically indicate chemical attachment of the chitosan with the glyceride. It is noted that Goddard teaches that the art has recognized that cross-linking of the ferulate substituent to a polysaccharide (page 1, lines 12-13) can alter the solubility and can facilitate producing viscous solutions or gels via the feruloylated substance (see page 1, lines 29-33). substitutions can render substances cross-linkable to produce viscous solutions or gels via the phenolic substitution (see page 1, lines 29-33). Goddard further teaches that the first and second polymers that are cross-linked together can also include fatty materials (see page 5, lines 15-22). Tanner also teaches that both pectin and chitosan are similar in that they are both edible film forming polysaccharides (page 6, lines 12-14). Thus, the art also fairly teaches chemically attaching feruloylated substances to a polysaccharide, for the purpose of producing viscous gels and effecting solubility. Thus, the ordinarily skilled artisan would have been fairly led to chemically attach the feruloylated glyderides for the purpose of preventing deterioration of the food, achieving the desired solubility and viscosity to the film.

Claims 1 and 23 further differ from the above combination in specifically reciting the use of a lipid such a fat, oil or wax and wherein the thickness of the edible barrier is from about 2 to 1500 micrometers (claim 1), 10-500 micrometers (claim 6) and 50-200 micrometers (claim 7).

Regarding the use of a lipid such as oil, fat or wax, it is noted that Iverson et al. teaches employing edible compositions for coating foodstuffs, wherein the composition comprises chitosan and further teaches the inclusion of an edible wax, such as

carnauba wax (paragraph 0028), which increases the coating adhesion and further retards moisture loss from the coated food item during storage (paragraph 0028). Haugaard further evidences that it has been conventional use chitosan with a lipid such as a wax, for instance, for the purpose of providing an edible protective barrier for foods (see page 193, “Fruits and Vegetables” and “Edible Coating"). Haugaard also teaches on page 192, the use of lipids in edible coatings (see under “Seafood”). To thus modify the combination and also include an edible wax, would thus have been obvious to one having ordinary skill in the art, for the purpose of increasing the coating adhesion and further retarding moisture loss from the coated food item during storage.

Regarding the particular thickness of the edible barrier, as recited in claims 1, 6 and 7, it is noted that the particular thickness, it is noted that since the art already teaches applying the edible barrier as a coating onto a material, the particular thickness of the barrier would have been a function of the particular food and the particular barrier properties desired.

In any case, Franzoni et al. teaches that it has been conventional in the art to produce a film comprising chitosan, wherein the film coats a food product such as feedstuff additives, and has a thickness of 50 microns, for instance (column 7, lines 60-61). Ninomiya et al. further evidences edible films that can comprise chitosan (column 4, lines 7-15 and column 7, lines 23-27). Thus, the particular thickness of the film would have been an obvious result effective variable, routinely determinable by experimentation, depending on the particular packaging purpose, sealability and concentration of the film desired.

Regarding claims 19 and 20, which recite that the feruloylated glycerides contains glycerol moieties containing one or two fatty acid chains, it is noted that Compton teaches producing feruloylated glycerides by reacting ethyl ferulate with vegetable oil, which produce ferulyl mono and di- acylglycerols (see example 4 on column 10). Regarding claim 20 which recites that the feruloylated glyceride is made by the reaction of a triglyceride, a ferulate and lipase, it is noted that the claim is directed to a product and not the process by which the product has been made. The combination thus already teaches feruloylated glycerides. In any case, Compton teaches employing a lipase, a triglyceride and a ferulate, as taught in example 4 on column 10 and on column 3, lines 39-44).

**7. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied above in the rejection of claims 1,6-7,19-20 and 23 relying on Nishiura as the primary reference, and in further view of Meyers (US 5376388).**

Regarding claim 21 and 22, the combination as applied above in the rejection relying on Nishiura as the primary reference teaches employing a lipid material in combination with a chitosan material for an edible barrier film. For instance, Haugaard already teaches an edible lipid material, such as carnauba wax. Additionally Haugaard teaches on page 192, the use of lipids in edible coatings (see under "Seafood"), and further teaches the use of fats and waxes to make edible coatings on nuts (see page

195 under “Edible Coating”). The combination, however, is silent in specifically reciting a fat or an oil from the group recited in claim 22.

Meyers teaches that it has been conventional to incorporate both chitosan and wax/oils in edible films, for the purpose of providing a hydrophobic barrier as well (see column 6, line 64-65 and column 7, lines 1-4). Tanner also evidences that it has been conventional to include a hydrophobic coating to an edible film, comprising a polysaccharide such as chitosan (page 6, line 14) and a hydrophobic component such as coconut oil or wax (page 6, lines 25-33). It is noted that the degree of hydrophobicity desired would clearly have been dependent on the particular moisture content of the food to be covered with the edible film, and based on the amount of moisture that the film would have had to repel. Nevertheless, since the art has clearly recognized employing combinations of lipids with chitosan, to thus modify the combination and employ a particular lipid, such as an edible fat or an oil such as coconut oil, would thus have been obvious to one having ordinary skill in the art, for the purpose of achieving the desired hydrophobic properties to the edible film.

**8. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 1,6-7,19-20 and 23, above, and in further view of Weibel (US 5008254), Oosterveld (“Oxidative cross-linking of pectic polysaccharides from sugar beet pulp”), and Fitchett (US 20020028197).**

Regarding claim 24, which recites that the biopolymer is sugar beet pectin, it is noted that Nishiura teaches that a pectin can also be used (see paragraph 0010 of the

translation). Additionally, it is noted that Tanner teaches that both pectin and chitosan are similar in that they are both film forming polysaccharides used for edible barrier films.

The claim differs in reciting that the polymer is a covalently cross-linked biopolymer of sugar beet pectin.

It is noted however, that the art has already recognized employing sugar beet pectin as an edible film former. For instance, Weibel teaches sugar beet pectin is an excellent film former used to encapsulate food products (see example 5 on column 19-20 and column 20, lines 2-9). Oosterveld further teaches that cross-linking of sugar beet pectin facilitates gelling and increases its viscosity (see abstract). Fitchett also evidences that cross-linking of sugar beet pectin (paragraph 0011) which can result in a film having moisture barrier properties (paragraph 0002 and 0077). Thus the art teaches that sugar beet pectin in a variety of forms, as also been conventionally applied to foods and can be used as a film former. To thus modify the combination and employ cross-linked sugar beet pectin would thus have been obvious to one having ordinary skill in the art, for the purpose of achieving the desired gelling to the film applied to the foodstuff.

Regarding attaching the feruloylated compound to the pectin, it is noted that, Goddard teaches cross-linking <u>a ferulated compound</u> to <u>a polysaccharide</u>, pectin (see page 1, line 12-13 regarding the polysaccharide). Thus, the art has recognized chemically attaching ferulated compounds to film formers that can be used in food products, as taught by Goddard (see page 4, lines 27-31; page 6, lines 4-21; page 11,

lines 30-38 and example 1 on page 12, line 9 to page 13, line 16). Goddard even teaches that the addition of phenolic acid substitutions can render substances cross-linkable to produce viscous solutions or gels via the phenolic substitution (see page 1, lines 29-33). Goddard further teaches that the first and second polymers that are cross-linked together can also include fatty materials (see page 5, lines 15-22). These teachings would have reasonably led one having ordinary skill in the art to include the feruloylated glycerides with the pectin, since the art teaches that it has been conventional to cross-link a feruloylated compound with pectin, and since the art teaches that glycerides (see Nishiura) and feruloylated glycerides (see Warner) prevent deterioration of the foodstuff. To thus modify the pectin polymer and attach feruloylated glycerides would thus have been obvious to one having ordinary skill in the art, for the purpose of ensuring that the edible barrier also is water insoluble and is not easily dislodged from the food surface as a result of contact with moisture and to prevent deterioration of the food.

9. **Claims 1, 6-7, 19-20 and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanner (WO9201394) in view of Muzzarelli (GB2272447) as further evidenced by Hall et al. (US 4424346) and Tharanathan, and in further view of Compton (US 6346236), Warner, Goddard (WO 0052092) and Uemura (JP05168449) and in further view of Ninomiya et al. (US 5089307) and Franzoni (US 5077052 A).**

Regarding claims 1 and 23, Tanner teaches an edible film which can comprise chitosan and a lipid such as an oil, such as coconut oil as recited in claim 22 (see page 6, line 14 and line 29). Claim 1 differs from Tanner in reciting that the chitosan is covalently coupled to vanillin groups.

Regarding the covalently coupled vanillin groups, Muzarelli, Hall and Tharanathan have been relied on as discussed above, to teach that it has been advantageous to covalently couple vanillin for the purpose of improving the strength of the edible film. To thus modify Tanner and covalently couple vanillin to chitosan would thus have been obvious to one having ordinary skill in the art, for the purpose of improving the strength of the film.

The claims 1 and 23 further differ in reciting chemically attached feruloylated glycerides. Regarding the limitation of "chemically attached feruloylated glycerides" the above combination is silent in this regard. Compton and Warner have been relied on as discussed in the rejection relying on Nishiura to teach the advantages of adding feruloylated glycerides - for the purpose of improving the water impermeability of the film. Goddard further evidences that it has been conventional to attach ferulated compounds to film forming polysaccharides for the purpose of altering the solubility and for producing highly viscous gels (see page 1, lines 29-33). Goddard has further been relied on upon as discussed above in paragraph 8, to teach that it has been advantageous to chemically attach a feruloylated substance with a polysaccharide. Uemura even teaches that it has been conventional to associate a ferulate with chitosan (see paragraph 0010 and 0012). Thus one having ordinary skill in the art would have

been fairly led to modify the combination and chemically attach feruloylated glycerides, for the purpose of ensuring that the edible barrier also is water insoluble and is not easily dislodged from the food surface as a result of contact with moisture and to prevent deterioration of the food.

Regarding the particular thickness of the film as recited in claims 1 and 6-7, it is noted that Tanner teaches that the hydrophobic portion results in a thickness of 50 microns (see page 7, lines 30-33) but is silent on the entire film having a thickness of 2-1500 microns.

Nevertheless, it is noted that the particular thickness, it is noted that since the art already teaches applying the edible barrier as a coating onto a material, the particular thickness of the barrier would have been a function of the particular food and the particular barrier properties desired.

In any case, Franzoni et al. teaches that it has been conventional in the art to produce a film comprising chitosan, wherein the film coats a food product such as feedstuff additives, and has a thickness of 50 microns, for instance (column 7, lines 60-61). Ninomiya et al. further evidences edible films that can comprise chitosan (column 4, lines 7-15 and column 7, lines 23-27). Thus, the particular thickness of the film would have been an obvious result effective variable, routinely determinable by experimentation, depending on the particular packaging purpose, sealability and concentration of the film desired.

Regarding claims 19 and 20, Compton has been relied on as discussed above in the rejection relying on Nishiura as the primary reference to teach feruloylated

glycerides containing one or two fatty acid chains and wherein the feruloylated glycerides are made by the reaction of a triglyceride, a ferulate and lipase. As discussed in the rejection above, it is noted that claim 20 is directed to a product and not the process of making the product. As such, the combination already teaches feruloylated glycerides.

Regarding claim 24, which recites that the biopolymer is sugar beet pectin, it is noted that the combination as applied to claims 1 and 23 teaches that both sugar beet pectin and chitosan have been conventional polysaccharides employed as the film formers for edible films (see Tanner, page 6, lines 12-14). Goddard has been relied on as discussed above in paragraph 8 as well. Therefore, to modify the combination and employ sugar beet pectin in combination with feruloylated glycerides would thus have been an obvious result effective variable, routinely determined by experimentation by the ordinarily skilled artisan, for the purpose of employing the particular polysaccharide that would provide the desired strength and film forming properties to the edible film.

**10. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied above in the rejection of claims 1,6-7,19-20,22-23 relying on Tanner as the primary reference, and in further view of Meyers (US 5376388) and Haugaard.**

Regarding claim 21, Tanner teaches employing an edible lipid such as wax and oil but is silent in an edible fat. Nevertheless, Meyers has been relied on as discussed

in the rejections above, to teach that both triglycerides have been conventional components to be combined with chitosan, when making edible films (see column 6, lines 64-65 and column 7, line 5). Haugaard further evidences that fats have also been conventionally employed to produce edible coatings on food (see page 195 - edible coatings on nuts). It is noted that the degree of hydrophobicity would clearly have been dependent on the particular moisture content of the food to be covered with the edible film and based on the amount of moisture that the film would have had to repel. To thus modify the combination and further include an edible fat or oil would thus have been obvious to one having ordinary skill in the art, for the purpose of achieving the desired degree of hydrophobicity to the film.

**11. Claims 1,6-7,19-20 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Forrest (US 2005184) in view of Weibel (US 5008254), Oosterveld ("Oxidative cross-linking of pectic polysaccharides from sugar beet pulp"), Thakur, Fitchett (US 20020028197), Fennema et al. (US 4915971) and Tanner (WO 9201394) and in further view of Goddard (WO 0052092), Compton (US 6346236), Warner, Bruggeman et al. (WO02071870) and Antheunisse et al. (US 20040009285) and in further view of Ninomiya et al. (US 5089307).**

Regarding claim 1 and 24, Forrest teaches an edible film comprising a lipid and pectin (page 1, right column, line 7 and line 15-17). Claim 1 differs from Forrest in reciting that the pectin is sugar beet pectin. It is noted however, that the art has already

recognized employing sugar beet pectin as an edible film former. For instance, Weibel teaches sugar beet pectin is an excellent film former used to encapsulate food products (see example 5 on column 19-20 and column 20, lines 2-9). Oosterveld further teaches that cross-linking of sugar beet pectin facilitates gelling and increases its viscosity (see abstract). Thakur further evidences that cross-linking of sugar beet pectin to improve its gelling ability (see page 50 "Pectin from sugar beet.." to page 51 1st paragraph on left column). Fitchett also evidences that cross-linking of sugar beet pectin (paragraph 0011) which can result in a film having moisture barrier properties (paragraph 0002 and 0077). Thus the art teaches that sugar beet pectin in a variety of forms, as also been conventionally applied to foods and can be used as a film former. To thus modify Forrest and employ cross-linked sugar beet pectin would thus have been obvious to one having ordinary skill in the art, for the purpose of achieving the desired gelling to the film applied to the foodstuff. Additionally, Fennema et al., for instance, further evidences that the combination of a hydrophilic and hydrophobic component to the edible film facilitate controlling the moisture in the food product (see abstract, column 1, lines 13-20 and column 1, lines 45-63). This is further evidenced by Tanner, who teaches an edible moisture barrier film comprising pectin (page 6, line 14) and a lipid (page 6, line 29) for the purpose of having the desired moisture barrier properties (page 4, lines 5-29).

Claims 1 and 24 further differ from this combination in reciting that the sugar beet pectin has chemically attached feruloylated glycerides. The claims do not provide any specificity as to how the feruloylated glycerides have been attached. It is noted

however, that Goddard teaches that it has been conventional to chemically bond together a ferulated component with a polysaccharide, such as sugar beet pectin (see example 1 on page 12, line 9 to page 13, line 16) which can be used as a coating for foods, where the pectin would exhibit improved gelling properties (see page 2, lines 37-38). Goddard has been further relied on as discussed above in paragraph 8. Compton and Warner have been relied on as discussed in the rejection relying on Nishiura to teach the advantages of adding feruloylated glycerides - for the purpose of improving the water impermeability of the film and for preventing deterioration of the food. Since the art already teaches the need to have water insoluble properties to edible films, as evidenced by Fennema and Tanner, for instance, and since the art already recognized crosslinking together a ferulated compound with sugar beet pectin for the purpose of enhancing the properties of the sugar beet pectin (see Goddard), these teachings would have reasonably led one having ordinary skill in the art to modify the sugar beet pectin and attach feruloylated glycerides, for the purpose of ensuring that the edible barrier also is water insoluble and is not easily dislodged from the food surface as a result of contact with moisture and so that the food is protected against deterioration.

Further regarding the limitation "sugar beet pectin having chemically attached feruloylated glycerides" it appears that Bruggeman et al. teaches that oxidization through the use of an enzyme can be employed after the combination of a feruloylated compound and a lipid, such as a fat or oil (see page 4, lines 12-15 and page 6, lines 11-13 and page 11, line30 to page 12, line 5). These cited portions teach that the oxidization using an enzyme occurs after the inclusion of a tri or di glyceride such as fat

or oil (page 4, lines 1-3). Antheunisse et al. also teaches this concept. For instance, Antheunisse et al. teaches that the oxidization of the ferulic acid groups to the pectin can be performed after the addition of the oil (see paragraph 0022). Thus, it would appear that Antheunisse et al. also teaches pectin having chemically attached feruloylated glycerides since the glycerides (i.e. the oil) would also appear to have been cross-linked with the pectin and the ferulic acid groups. Both Bruggeman et al. and Antheunisse also teach that this cross-linking improves the stability of the emulsion (see paragraph 0022 of Antheunisse and Bruggeman page 5, lines 8-27). Since applicants also appear to use enzymes to produce the feruloylated glycerides, it would appear that oxidization of the pectin and oil together would also have resulted in chemically attached ferouylated glycerides to the sugar beet pectin, especially since the pectin already contains ferulate groups.

Regarding the thickness of the film as recited in claims 1, 6 and 7, it is noted that the particular thickness, it is noted that since the art already teaches applying the edible barrier as a coating onto a material, the particular thickness of the barrier would have been a function of the particular food and the particular barrier properties desired.

In any case, Ninomiya et al. further evidences edible films that can comprise pectin and can have a thickness of 10 microns (column 3, lines 63-64 and column 7, lines 23-27). Thus, the particular thickness of the film would have been an obvious result effective variable, routinely determinable by experimentation, depending on the particular packaging purpose, sealability and concentration of the film desired.

Regarding claims 19 and 20, Compton has been relied on as discussed above in the rejection relying on Nishiura as the primary reference to teach feruloylated glycerides containing one or two fatty acid chains and wherein the feruloylated glycerides are made by the reaction of a triglyceride, a ferulate and lipase.

**12. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 1,6-7,19-20 and 24 above in the rejection relying on Forrest (US 2005184) as the primary reference, and in further view of Meyers (US 5376388).**

Regarding claim 21 and 22, the combination as applied above in the rejection relying on Forrest as the primary reference teaches employing a lipid such as vegetable oil but is silent in specifically reciting a fat or an oil from the group recited in claim 22. Nevertheless, Meyers and Tanner have been relied on as discussed above in the similar rejection relying on Haugaard to teach that it has been conventional to include a hydrophobic component to the edible film, for the purpose of achieving a degree of hydrophobicity. It is noted that the degree of hydrophobicity would clearly have been dependent on the particular moisture content of the food to be covered with the edible film and based on the amount of moisture that the film would have had to repel. To thus modify the combination as applied in the rejection relying on Nishiura as the primary reference and further include an edible fat or oil would thus have been obvious to one having ordinary skill in the art, for the purpose of achieving the desired degree of hydrophobicity to the film.

**13. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 1,6-7,19-20 and 24 in the rejection relying on Forrest as the primary reference, and in further view of Muzzarelli (GB2272447) as further evidenced by Hall et al. (US 4424346) and Tharanathan ("Biodegradable films and composite coatings: past, present and future").**

Claim 23 differs from the combination as applied to claims 1 and 24 in reciting that the biopolymer is chitosan with covalently coupled vanillin groups.

As discussed in the rejection above, however, it is noted that the art has recognized that both chitosan and pectin have both been conventionally employed as the polysaccharide edible film formers, as evidenced by Tanner on page 6, line 14. Since different polysaccharides can result in different properties to the film, to modify the combination and employ chitosan as the polysaccharide film former would thus have been an obvious result effective variable, routinely determined by experimentation. Regarding the chitosan having covalently coupled vanillin groups, it is noted that Muzarelli, Hall and Tharanathan have been relied on as discussed in the rejections relying on Nishiuara and Haugaard, to teach that it has been advantageous to covalently couple vanillin for the purpose of improving the strength of the edible film. To thus modify the combination and employ chitosan coupled with vanillin as the edible film former would thus have been an obvious result effective variable, routinely determined by experimentation for the purpose of achieving the desired properties to the edible barrier.

**14. Claims 1,6-7, 19, 22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Antheunisse et al. (US 20040009285) and in further view of Tanner (WO9201394) and in further view of Ninomiya et al. (US 5089307).**

Regarding claims 1 and 24, Antheunisse et al. teaches an edible oil in water emulsion (paragraph 0045) comprising sugar beet pectin and a lipid, such as oil (paragraph 0019, 0022, 0023 and 0046), which have been oxidized, after these two components have been blended together (see paragraph 0022). Antheunisse teaches that this results in increased stability (paragraph 0022). It is noted that claims 1 and 24 do not specify how the feruloylated glycerides have been chemically attached. Additionally, it is noted that the claims are directed to a product and not the process of making the product. In this case, there would have been a reasonable expectation that the ferulic acid groups would have also bound to the glycerides of the oil during the oxidization process, thus producing a cross linked biopolymer of sugar beet pectin and chemically attached feruloylated glycerides.

Claim 1 and 24 differs from Antheunisse in reciting the inclusion of a lipid material and the barrier film having a thickness of 2 to 1500 microns.

Regarding the lipid material, Tanner teaches the inclusion of a hydrophobic layer to a pectin based film ( page 6, lines 12-14 and page 10, lines 34-38) for providing moisture impermeability (see page 3, lines 18-22). To thus modify the edible emulsion taught by Antheunisse and employ an oil coating would thus have been obvious to one having ordinary skill in the art, for the purpose of providing moisture impermeability.

Regarding the thickness of the film as recited in claims 1, 6 and 7, it is noted that this would have been an obvious result effective variable, routinely determined through experimentation depending on the degree of protection desired from the edible film. In any case, Ninomiya et al. further evidences edible films that can comprise pectin and can have a thickness of 10 microns (column 3, lines 63-64 and column 7, lines 23-27). Thus, the particular thickness of the film would have been an obvious result effective variable, routinely determinable by experimentation, depending on the particular packaging purpose, sealability and concentration of the film desired.

Regarding claim 22, it is noted that the combination already teaches the inclusion of an oil coating, such as using coconut oil (see Tanner, page 6, lines 25-29).

Regarding claim 19 which recites that the feruloylated glycerides contain glycerol moieties containing one or two fatty acid chains, it is noted Antheunisse teaches that the oil combined with the sugar beet pectin can be coconut oil or butter fat. These substances would have been recognized by the ordinarily skilled artisan to contain one or two fatty acid chains.

**15. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied above in the rejection of claims 1,6-7, 19, 22 and 24 relying on Antheunisse et al. as the primary reference, and in further view of Meyers (US 5376388) and Haugaard.**

Regarding claim 21, the combination teaches employing an edible lipid such as oil but is silent in an edible fat. Nevertheless, Meyers has been relied on as discussed in the rejections above, to teach that both triglycerides have been conventional components to be combined with chitosan, when making edible films (see column 6, lines 64-65 and column 7, line 5). Haugaard further evidences that fats have also been conventionally employed to produce edible coatings on food (see page 195 - edible coatings on nuts). It is noted that the degree of hydrophobicity would clearly have been dependent on the particular moisture content of the food to be covered with the edible film and based on the amount of moisture that the film would have had to repel. To thus modify the combination and further include an edible fat or oil would thus have been obvious to one having ordinary skill in the art, for the purpose of achieving the desired degree of hydrophobicity to the film.

**16. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 1, 6-7, 19, 22 and 24 and in further view of Compton (US 6346236) and Warner ("94$^{th}$ AOCS Annual Meeting & Expo").**

Claim 20 recites that the feruloylated glycerides is made by the reaction of a triglyceride, a ferulate and lipase. The claims differ from the above combination in this regard. It is noted, however, that the claim is directed to a product and not the process by which the product has been made. The combination thus already teaches feruloylated glycerides. In any case, Compton teaches employing a lipase, a

triglyceride and a ferulate, as taught in example 4 on column 10 and on column 3, lines 39-44). Warner further teaches feruloylated triglycerides which can be used in food applications. Therefore, to employ another mechanism for feruloylating a glycerides such as a triglyceride would have been obvious to one having ordinary skill in the art for the purpose of achieving the desired degree of cross-linking between the glycerides and the ferulate, for instance.

## ***Double Patenting***

17. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

**18. Claims 1,6-7,19-22 and 24 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 4-5 of U.S.**

**Patent No. 7052729 in view of Oosterveld and Fitchett (US 20020028197), Goddard (WO0052092), Compton (US 6346236) and Warner ("94$^{th}$ AOCS Annual Meeting & Expo") and in further view of Ninomiya et al. (US 5089307).**

Regarding claims 1 and 24, claims 4-5 of U.S. Patent 7052729 teach an edible film comprised of a cross-linked polysaccharide. Pending claim 1 differs from the patented claims in specifically reciting employing sugar beet pectin.

Oosterveld further teaches that cross-linking of sugar beet pectin facilitates gelling and increases its viscosity (see abstract). Fitchett also evidences that cross-linking of sugar beet pectin (paragraph 0011) which can result in a film having moisture barrier properties (paragraph 0002 and 0077). Thus the art teaches that sugar beet pectin in a variety of forms, as also been conventionally applied to foods and can be used as a film former. Since the patented claims already teach employing a cross-linked polysaccharide and since Oosterveld teaches that cross-linking of sugar beet pectin facilitates gelling and increases viscosity and since Fitchett teaches the use of cross-linked sugar beet pectin edible films, to thus modify the patented claims and employ cross-linked sugar beet pectin would thus have been obvious to the ordinarily skilled artisan, for the purpose of achieving the desired degree of gelling and viscosity.

Pending claims 1 and 24 further differs from this combination in reciting that the sugar beet pectin has attached feruloylated glycerides and a lipid and wherein the film has a thickness of 2-1500 micrometers.

It is noted however, that patented claim 4 reads on cross-linking occurring after forming an oil in water emulsion, and thus reads on the feruloylated polysaccharide

further comprising feruloylated glycerides (based on the oil). In any case, regarding the feruloylated glycerides, it is noted that Goddard teaches that it has been conventional to chemically bond together a ferulated component with a sugar beet pectin (see example 1 on page 12, line 9 to page 13, line 16) which can be used as a coating for foods, where the pectin would exhibit improved gelling properties (see page 2, lines 37-38), wherein the feruloylated substance can also comprise a fat substance therein (page 5, lines 15-22). Additionally, Compton teaches employing feruloylated glycerides in water in oil or oil in water emulsions compositions (column 7, lines 2-5), for the purpose of preventing the emulsion from being readily washed off with water (see column 5, lines 52-56). Compton further teaches that the feruloylated glycerides can be used in applications other than sunscreens (column 2, lines 11-14 and column 7, lines 52-54) and further teaches that the modified ferulate compounds renders the compounds water insoluble (column 2, lines 3-7). Additionally, the art has recognized employing these feruloylated glycerides in food related applications, such as for preventing deterioration of frying oil, as evidenced by Warner (see page 93, "Addition of Feruloylated Monoacyl- and Diacylglycerols to Frying Oils"). In view of these teachings, it is noted that the art has recognized that feruloylated glycerides provide the additive function of preventing water solubility in emulsions and which can prevent water from dislodging the film, and that they can be applied in food related applications. Since the art already teaches the need to have water insoluble properties to edible films, as evidenced by Fennema and Tanner, for instance, and since the art already recognized crosslinking together a ferulated compound with sugar beet pectin for the purpose of enhancing the properties

of the sugar beet pectin (see Goddard), these teachings would have reasonably led one having ordinary skill in the art to modify the sugar beet pectin and attach feruloylated glycerides, for the purpose of ensuring that the edible barrier also is water insoluble and is not easily dislodged from the food surface as a result of contact with moisture.

Regarding the film also comprising a lipid such as oil, it is noted that by disclosing an oil in water emulsion, the patented claims teach a second component being a lipid material.

Regarding the thickness of the film as recited in claims 1, 6 and 7, it is noted that the particular thickness, it is noted that since the art already teaches applying the edible barrier as a coating onto a material, the particular thickness of the barrier would have been a function of the particular food and the particular barrier properties desired.

In any case, Ninomiya et al. further evidences edible films that can comprise pectin and can have a thickness of 10 microns (column 3, lines 63-64 and column 7, lines 23-27). Thus, the particular thickness of the film would have been an obvious result effective variable, routinely determinable by experimentation, depending on the particular packaging purpose, sealability and concentration of the film desired.

Regarding claims 19 and 20, which recite that the feruloylated glycerides contains glycerol moieties containing one or two fatty acid chains, it is noted that Compton teaches producing feruloylated glycerides by reacting ethyl ferulate with vegetable oil, which produce ferulyl mono and di- acylglycerols (see example 4 on column 10). Regarding claim 20 which recites that the feruloylated glyceride is made by the reaction of a triglyceride, a ferulate and lipase, it is noted that the claim is directed to

a product and not the process by which the product has been made. Compton teaches employing a lipase, a triglyceride and a ferulate, as taught in example 4 on column 10 and on column 3, lines 39-44).

**19. Claim 23 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 4-5 of U.S. Patent No. 7052729 in view of Oosterveld and Fitchett (US 20020028197), Goddard (WO0052092), Compton (US 6346236) and Warner ("94$^{th}$ AOCS Annual Meeting & Expo") and in further view of Ninomiya et al. (US 5089307) as applied directly above, and in further view of Tanner (WO9201394), Muzzarelli (GB2272447) as further evidenced by Hall et al. (US 4424346) and Tharanathan ("Biodegradable films and composite coatings: past, present and future").**

Claim 23 differs from the patented claims in reciting that the polysaccharide is chitosan with covalently coupled vanillin groups.

As discussed in the rejection above, however, it is noted that the art has recognized that both chitosan and pectin have both been conventionally employed as the polysaccharide edible film formers, as evidenced by Tanner on page 6, line 14. Since different polysaccharides can result in different properties to the film, to modify the combination and employ chitosan as the polysaccharide film former would thus have been an obvious result effective variable, routinely determined by experimentation. Regarding the chitosan having covalently coupled vanillin groups, it is noted that Muzarelli, Hall and Tharanathan have been relied on as discussed in the rejections

relying on Nishiuara and Haugaard, to teach that it has been advantageous to covalently couple vanillin for the purpose of improving the strength of the edible film. To thus modify the combination and employ chitosan coupled with vanillin as the edible film former would thus have been an obvious result effective variable, routinely determined by experimentation for the purpose of achieving the desired properties to the edible barrier.

### *Claim Objections*

20. Claims 1,6-7 and 19-24 are objected to because of the following informalities: Claim 1 recites the limitation "feruloylated glycerides." It appears that the correct spelling of the term is feru**l**oylated glycerides. Appropriate correction is required.

### *Specification*

21. It is noted that the specification also appears to have the same spelling error related to the feruloylated glycerides as the claim. Appropriate correction is required.

### *Response to Arguments*

22. In the response filed April 1, 2010, applicants arguments are based on the rejections failing to teach cross-linked sugar beet pectin or a biopolymer having chemically attached feruloylated glycerides and a lipid material which is an edible oil, fat or wax.

It is noted that the art has clearly recognized that the it has been conventional to use sugar beet pectin and chitosan having covalently attached vanillin groups, as edible barrier films for food products. The art has also taught that a second lipid component such as an oil, fat or wax has also been advantageous for the purpose of providing a degree of hydrophobicity to the film, which would thus control the amount of water released out from the food product. The art also further teaches that feruloylated glycerides have also been conventionally employed in oil in water and water in oil emulsions, for the purpose of giving the emulsion water insoluble properties and preventing the emulsion from being dislodged by water. The art recognized that these feruloylated glycerides can also be employed in food related applications. In view of these teachings, and since the art recognized that it has been conventional to further chemically attach ferulated compounds to polysaccharide film formers, this would have fairly led one having ordinary skill in the art, to also attach feruloylated glycerides to edible film formers of pectin and chitosan, for the purpose of providing a degree of water insolubility and for preventing the films from being dislodged by water at the surface of the food.

## ***Conclusion***

23. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 5641533 discloses combining pectin, calcium chloride and oil together, wherein the calcium chloride results in cross-linking of the components

together (see column 2, lines 29-37 and example 2, where calcium chloride with oil has been added to a pectin composition)..

Any inquiry concerning this communication or earlier communications from the examiner should be directed to VIREN THAKUR whose telephone number is (571)272-6694. The examiner can normally be reached on Monday through Friday from 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena Dye can be reached on (571)-272-3186. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Viren Thakur/
Examiner, Art Unit 1782